

# Praxair H2 Storage and Compression: LAX

State Energy Program, Special Projects  
Category 6.53 Power Technologies:  
Compression, Storage & Dispensers  
(Project 67)

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Presentation to the Department of Energy  
May 22, 2003



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# ***Agenda***

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- **Praxair Hydrogen**
- **Program Structure**
- **Program Overview**
- **Program Objectives**
- **Approach**
- **Schedule**
- **Accomplishments & Progress**
- **Questions**

# **Praxair Hydrogen**



- **Only Hydrogen Supplier in All Sizes (Cylinders to Liquid to Pipeline)**
  - First industry-financed liquid hydrogen facility (1959)
  - Six large LH<sub>2</sub> plants designed, constructed, and operated
  - Largest capacity single-train LH<sub>2</sub> production system (60 t/d)
  - Four LH<sub>2</sub> plants currently in operation
  - Smallest industrial SMR-based product line (HGS)
- **Over 500 Million SCFD Combined Capacity**
- **Distribution Network:**
  - Over 600 GH<sub>2</sub> and LH<sub>2</sub> customers
  - 50 LH<sub>2</sub> trailers, 16 LH<sub>2</sub> rail cars
  - Over 250 miles of GH<sub>2</sub> pipeline
  - 150 GH<sub>2</sub> tube trailers
- **First PSA H<sub>2</sub> Unit (Over 300 Designed and Built)**

# ***Program Structure***



## ➤ **Program Participants**

- Praxair, as Program Leader
- BP, as Advisor

## ➤ **Program Contributors**

- US Department of Energy (DOE)
- California Energy Commission (CEC)
- South Coast Air Quality Management District (AQMD)
- Los Angeles International Airport (LAX / City of LA)
- Praxair

# ***Program Overview***



- **Design, Develop, Install & Operate H2 Fueling Station**
  - Integration & Packaging of Existing Technology
  - Electrolysis based On-Site Production
  - Up to Five Light-Duty Vehicles per day
  - Five Minute “Fast Fills”
  - Future Growth Flexibility to meet Demand
  - Enabled for Heavy-Duty (Bus) Fills
  - Two Year Program
- **Demonstration of Hydrogen based Fueling Infrastructure**

# Objectives

- **Support a Small Fleet of Hydrogen Fueled Vehicles**
  - California Fuel Cell Partnership Goal to introduce up to 60 HFCVs by 2003
  - Compatibility with other Fueling Stations
- **Modular & Reproducible Design**
- **Station Characterization**
  - Performance
  - Maintenance
  - Operation
  - Cost of Delivered Product

# ***Relevance***

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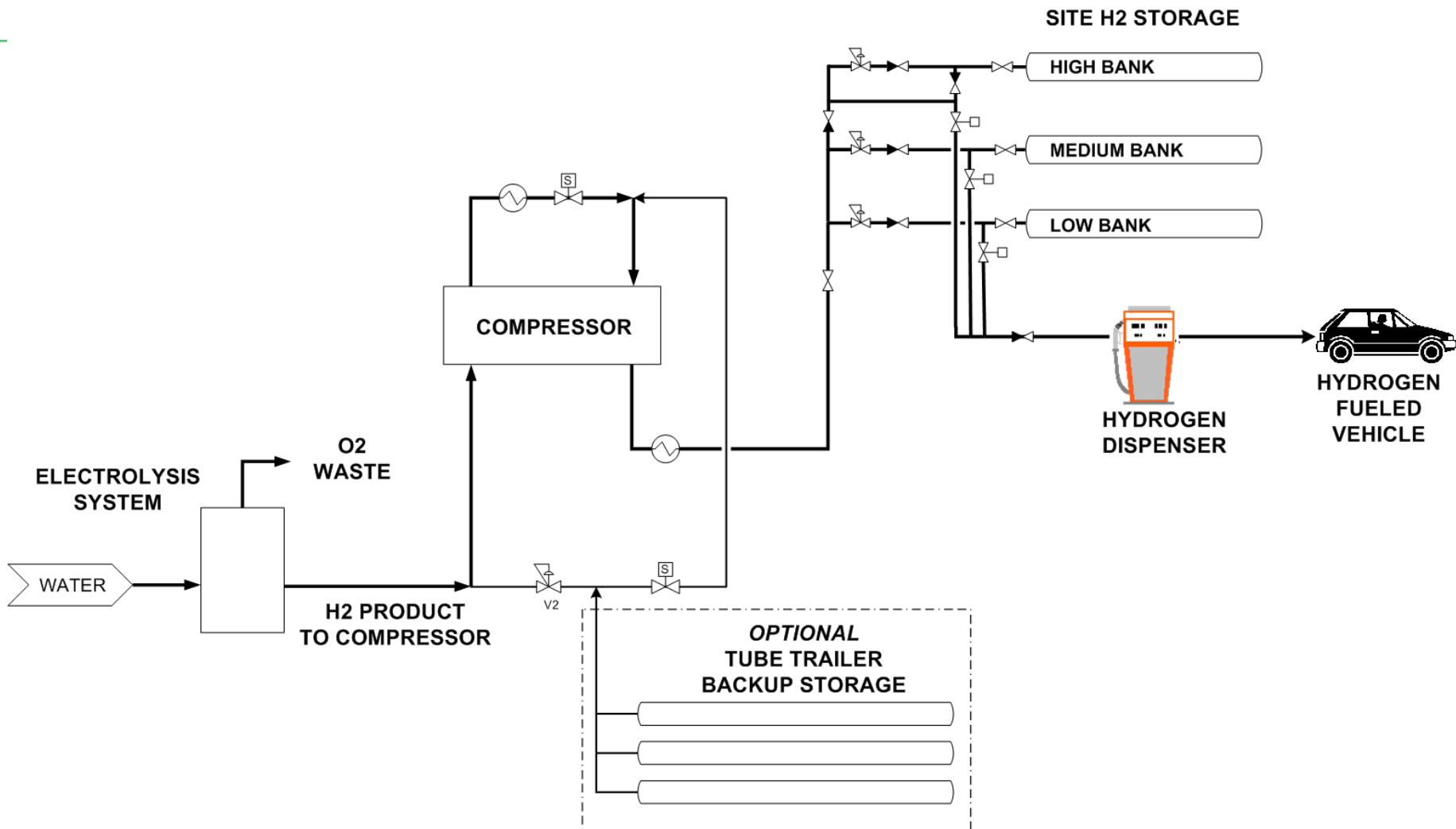
## ➤ **Design Considerations**

- Layout / Spacing Limitations
- Aesthetic Appearance
- Application of Industrial Codes to Commercial Setting

## ➤ **Modifications to Base Design**

- Simulated Commercial Environment
- Integrated, Aesthetic Packaging
  - Low-Profile
  - Tighter Footprint

# Approach- Block Flow Diagram





# Approach- Overview

## ➤ Hydrogen Production

- Electrolysis based
- Proven Design from Stuart Energy
- Integrated Packaging
- 24 kg/day Capacity



# Approach- Overview

## ➤ **Compression**

- Hydraulically Driven Reciprocating Compressor
- Flexible Operational Modes

## ➤ **Storage**

- Traditional ASME Coded Steel Construction
- Cascaded Bank Configuration
- Demonstration of Other Configurations Possible

## ➤ **Dispensing**

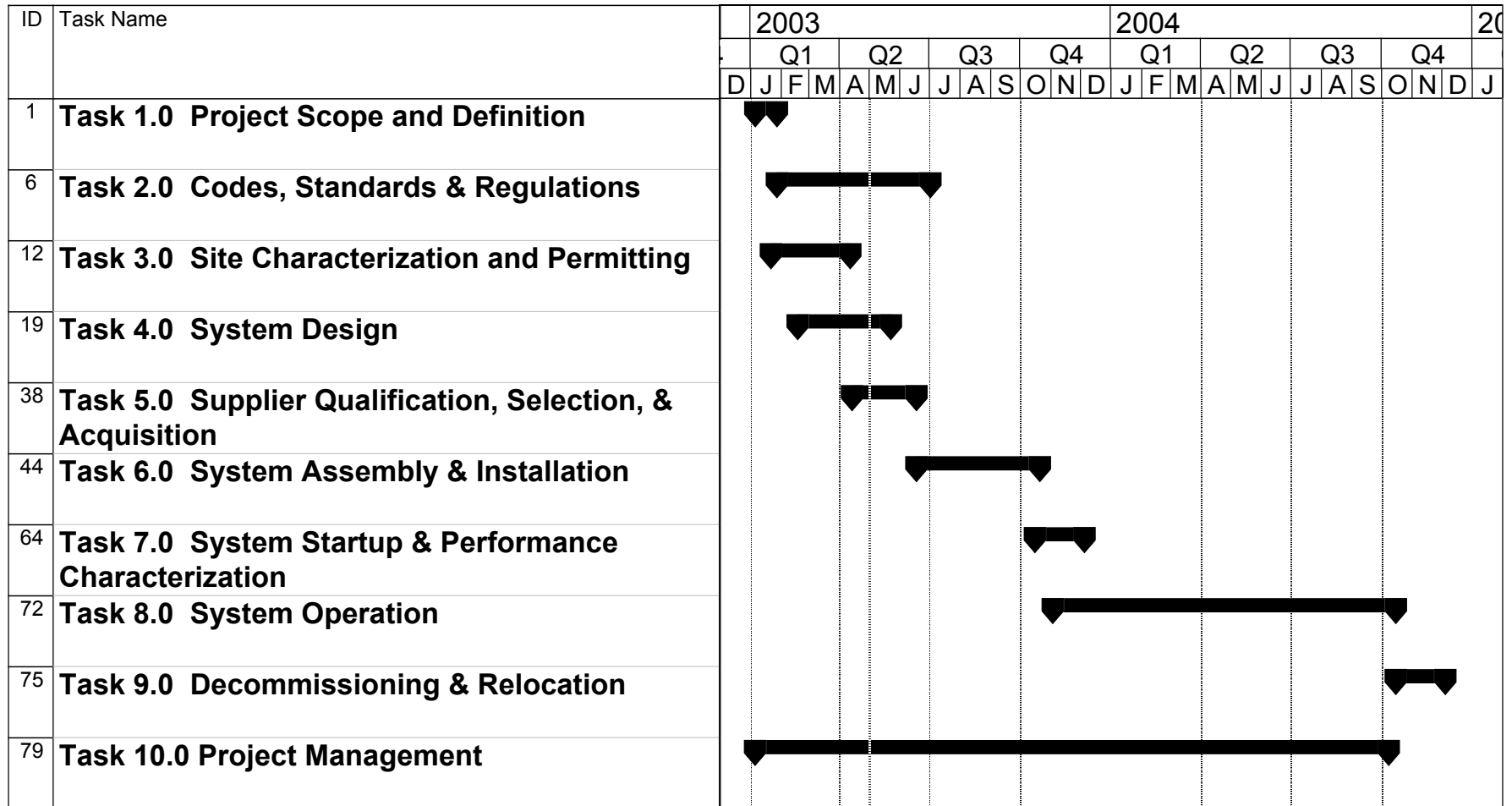
- Fast Fills of Cars within 5 minutes
- Enabled for Bus Fueling
- BP Preferred Configuration

# Schedule Overview

## ➤ Project Milestones

- Planned Start Oct 2002
- Actual Start (Contracting Delay) Jan 2003
- Site Selection & Characterization Mar 2003
- Equipment On Order May 2003
- Permit Applications Jun 2003
- Installation Sep 2003
- Hydrogen Available Nov 2003

# Program Timeline



# ***Accomplishments / Progress***



- **Progress limited by Contracting Delay**
- **Project Status Update**
  - Permitting
    - CEQA / NEPA Review
    - Permit Applications
  - Conceptual Design Complete
  - Major Equipment Ordered
  - Preliminary Drawing Packages Complete
  - Detail Design On-Going

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## Questions?

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